Do we know our Sun and its Origin?

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Abstract: The common belief about the Sun is that it is covered with hydrogen, implying that the Sun body is composed mostly of hydrogen and hydrogen fusion reaction is the major energy source. The surface temperature 5780 °K of the Sun and a simple temperature gradient calculation disproves this Hydrogen Sun Model, which has dominated science for more than half century. The correlated chemical and isotopic heterogeneities of elements in meteorites strongly suggest that our solar system was produced from the debris of a single supernova. Cores of the Sun and the four inner planets formed in the central iron-rich region of the supernova debris that made the solar system. The majority of the energy of the Sun is not from the hydrogen fusion reaction but from other sources.

Keyword: The Sun, composition, energy source.

1. Hydrogen Sun Model

The "Hydrogen Sun Model" assumes that the Sun is composed mostly of hydrogen and that hydrogen fusion reaction occurring at @1.5 x 10^7 °K is its major energy source. I have one simple argument to disprove the validity of the "Hydrogen Sun Model".

The "Hydrogen Sun Model" disagrees with the surface temperature 5780 °K of the Sun we observe. It also disagrees with the 1380 watt/m^2 value of the radiation energy of the Sun measured by orbiting satellite above the Earth atmosphere. "Hydrogen Sun Model" assumes that the fusion reaction takes place at @ 1.5 x 10^7 °K via tunneling in the core which is within a distance of 1 x 10^8 m from the center of the Sun. Heat can be transferred by black body radiation, conduction and convection. Considering only the heat transfer via black body radiation and using the simple black body radiation law and the conservation of energy,

$$4\pi R_c^2 s T_c^4 = 4\pi R_s^2 s T_s^4 \quad (1)$$

$$4\pi R_c^2 s T_c^4 = 4\pi R_{se}^2 E \quad (2)$$

R_c is a distance of 1 x 10^8 m from the center of the Sun, T_c @ 1.5 x 10^7 °K is the core temperature proposed by hydrogen Sun model, R_s= 6.96 x 10^8 m is the radius of the Sun, T_s is the temperature at the surface of the Sun, s is Stefan–Boltzmann constant 5.67 x 10^{-8} watt·m^{-2}·K^{-4}, R_{se} =1.5 x 10^{11} m is the distance from the center of the Sun to the surface of the atmosphere of the Earth, E is the radiation energy of the Sun on the surface of the Earth atmosphere. From equation (1) the temperature $T_s$at the surface of the Sun is found to be 5.69 x10^6 °K. If one considers heat transferred by the black body radiation, conduction and convention and/or considers heat generated by fusion reaction in the region between 1 x 10^8 m from the center of the Sun and the surface of the Sun, one should get the temperature of more than 5.69 x 10^6 °K at the surface of the Sun. This is because the faster the heat transfers the less steep is the temperature gradient. If one considers the emissivity of hydrogen at the core which is within 1 x 10^8 m from the center of Sun to be different from that at surface of the Sun,

$$\varepsilon_c 4\pi R_c^2 s T_c^4 = \varepsilon_s 4\pi R_s^2 s T_s^4 \ (3)$$

ε_c is the emissivity of hydrogen at the core of the Sun , ε_s is the emissivity of hydrogen at its surface. Benton (1955)studied the emissivity of hydrogen atoms at temperatures from 8400 °K to 12600 °K, and at pressure from 10 atm to 200 atm. He found that at constant pressure, the emissivity increased with temperature, while at constant temperature, the emissivity increased with pressure. For example: At 12600 °K and 10 atm, the emissivity of hydrogen atom is 0.48. At 12600 °K and 100 atm, ε is 0.96. At 8400 °K and 100 atm ε is 0.15. So, it is obvious that emissivity of hydrogen at the core ε_c should be greater than the emissivity of the hydrogen at the surface of the Sun ε_s . Therefore, the temperature T_2 one gets from equation (3) should be more than 5.69 x 10^6 °K. This temperature of 5.69 x 10^6 °K is inconsistent with the temperature of @ 5780 °K which we observe from the surface of the Sun. From equation (2), E is 1.28 x 10^{15} watt/m^2, which is inconsistent with the 1380 watt/m^2 value of the radiation energy of the Sun measured by orbiting satellite above the Earth atmosphere.

The temperature of @1.5 x 10^7 °K at the surface of the core of the Sun is also assumed by the Hydrogen Sun model to generate enough kinetic pressure to protect the hydrogen-rich core from collapsing, due to the compression pressure of outer layer. So, disproving this core temperature of @1.5 x 10^7 °K also disproves that the Sun consists of mostly hydrogen.

2. Inner Planets of our solar system

The most popular model of planetary origins assumes the Sun and its planets were formed separately, the four inner planets of the solar system were chemically homogeneous and a separation process resulted in the present form (iron sank to form the present core). This popular model ignores four simple facts that argue against the separation process.

(1) Viscosity disfavors separation process. The inner core of the Earth is under extremely high pressure about 3,000,000 atm. Brazhkin and Lyapin (2000)proposed that the viscosity near the inner core is as high as 10^{11} Pa·s. The viscosity of liquid iron under normal pressure is about 10^{-2} Pa·s.

(2) Iron and silicon form alloys, the formation of which disfavors this separation process.

(3) The separating process decreases entropy. The entropy factor disfavors the separation process. The higher the temperature, the larger is the effect of this entropy factor. This can be understood by the following equation:

$$\Delta G = \Delta H \ - \ T\Delta S \ (4)$$

ΔG is the change of the Gibbs free energy of separating process, ΔH is the change of enthalpy of separation process, ΔS is the change of entropy of the separation process which is negative, so the – TΔS term becomes positive. ΔG must be negative to do the spontaneous process.

(4) If the iron sinks to the center, the whole body will expand. This action will increase the gravitational energy so that the net gravitational energy change of this separation process is not necessarily negative. In fact, Hwaung (1982) calculated that the net gravitational energy change of the separation process of a homogeneous Earth is positive.

A simple question was raised by Hwaung (1982): Can two immiscible liquids separate into two layers in a zero external gravitational field?

The results of an experiment carried out on a NASA space shuttle in 1983 showed that a mixture of two immiscible liquids oil and water did not separate into two layers in zero external gravitational fields.

This experiment coupled with my arguments above and the fact that the present inner core of the Earth is a solid iron-rich core; strongly suggest that the inner core of the Earth was originally an iron-rich core. This implies the inner iron-rich cores of all four inner planets of our solar system were original iron-rich cores, which, over time, were layered with Silicon and lighter elements. This also strongly implies that the Sun and four inner planets were in the center of the iron-rich core region of supernova debris and the Sun has an original iron-rich core.

3. Iron Core Sun Model

Manuel et al (1975,1977,1981,1982) interpreted correlated chemical and isotopic heterogeneities of elements in meteorites as evidence that our solar system was produced from debris of a single supernova the cores of the Sun and four inner planets formed in the central Fe-rich region of supernova debris. In 1982 Hwaung and Manuel (1982,1983)proposed the "Iron Core Sun Model" which states that the core of the Sun consists mostly of iron covered with lighter elements and surrounded by a layer of hydrogen. The isotopic composition of noble gases in the solar wind shows high enrichment of light isotopes. When corrected for mass fractionation of all five noble gases, they can be resolved in term of two primitive noble gas components that have been identified in planetary solids (Manuel and Hwaung,1983). When abundance of the elements at the surface of the Sun is corrected for this fractionation, it is shown that atomic abundance for major elements in the bulk Sun are (in decreasing order): Fe, Ni, O, Si, S, and Ca (Manuel and Hwaung,1983).

Where does the radiation energy of the Sun come from? The possible sources are:

(1) Hwaung (2009) hypothised that the high compression pressure in the core of the Sun converted part of the mass of iron to energy.

(2) Hwaung(1982) suggested that most of the Sun's radiation energy comes from the black body radiation of residual heat of the iron-rich core and from the conversion of gravitational energy with only a small portion of the radiation energy coming from the hydrogen fusion reaction.

(3) The high gravitational field and compression pressure compress the iron atom of the iron-rich core. The compression process releases coulomb energy.

(4) Manuel and co-workers (2001,2003,2006) suggested that the repulsive interactions between neutrons are the energy source for the Sun.

(5) Other unknown type of energy sources which radiate constant energy per minute or even shorter time unit.

4. Conclusion

The spirit of the science is to make human-beings understand nature better. The proposed "Iron-rich Core Model" will stimulate intellectual debate and propel scientists to strive to identify the composition of the Sun. It will also lead creative scientists toward still better models of our Sun that someday might lead to new types of energy sources in the future.

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